object 1 or the wavelength λ of the incident illumination light 24 is changed, it is known from a relation presented by equation 2 that the diffraction angle θ of the first order diffraction light to the incident angle ψ of the incident illumination light 24 changes and the first order diffraction light incident into the pupil 10a of the objective lens 9 also changes.

If the type of the inspected object 1 such as, for example, the LSI wafer is changed, the pitch P (density or periodicity) of the pattern thereon also changes. If the type of the LSI wafer is changed to, for example, 256M DRAM or 64M DRAM, the pitch P (density or periodicity) of the pattern also changes. If the process is changed even though the types are of the same, the density (periodicity) of the pattern may change, for example, the pitch P of the pattern of the inspected object in the wiring process or the diffusion process changes. In one chip on the LSI wafer, the pitches P of the patterns of the memory and the peripheral circuit differ from each other.

It is necessary to change the wavelength λ of the incident illumination light 24 in accordance with the cross sectional structure of the inspected object 1. For example, a thickness of a thin film which forms the inspected object 1 varies and therefore the reflected light from the inspected object is caused to change due to an optical interference in the thin film. To avoid such variation of the reflected light, it is necessary to change the wavelength λ of the incident illumination light 24 to select the wavelength λ of

the incident illumination light 24 with which the optical interference hardly occurs in the thin film. For example, as shown in other embodiments described later, the wavelength λ of the incident illumination light 24 can be changed through a wavelength selection filter by using a light source which emits lights, respectively, having a plurality of types of wavelength in the illumination optical system.

If the pitch P (density or periodicity) of the pattern on the inspected object 1 or the wavelength λ of the incident illumination light 24 is changed, the diffraction angle θ of the first order diffraction light to the incident angle ψ of the incident illumination light 24 changes and the first order diffraction light incident into the pupil 10a of the objective lens 9 also changes. Therefore, the value σ of the secondary light source for annular-looped illumination, that is, the incident angle ψ of the illumination light 24 to the inspected object 1 should be controlled in accordance with the type or the cross sectional structure of the inspected object 1 so that, particularly, the first order diffraction light of the diffraction lights produced from the inspected object is introduced into the pupil 10a of the objective lens 9 in an optimal condition.

Therefore, the CPU 20 carries out a Fourier transform image analysis of digital Fourier transform image signals on the pupil 10a (Fourier transform plane) of the objective lens 9 obtained from the image sensor 12b through the A/D converter 15b and edge density determination (periodicity or density determination of the pattern on the inspected object 1)